

Ireena Erteza is Sandia's 2017 Asian American Engineer of the Year

See page 12

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## Sandia Lab News



Managed by Sandia Corporation for the National Nuclear Security Administration

## Using kinetics, not temperature, to make ceramic coatings

**By Sue Major Holmes** 

esearcher Pylin Sarobol explains an elegant process for ultrafine-grained ceramic coatings in a somewhat inelegant way: submicron particles splatting onto a surface.

That splatting action is a key part of a Sandia project to lay down ceramic coatings kinetically. By making high-velocity submicron ceramic particles slam onto surfaces at room temperature, Pylin (1832) and her colleagues avoid the high temperatures otherwise required to process ceramics like alumina and barium titanate.

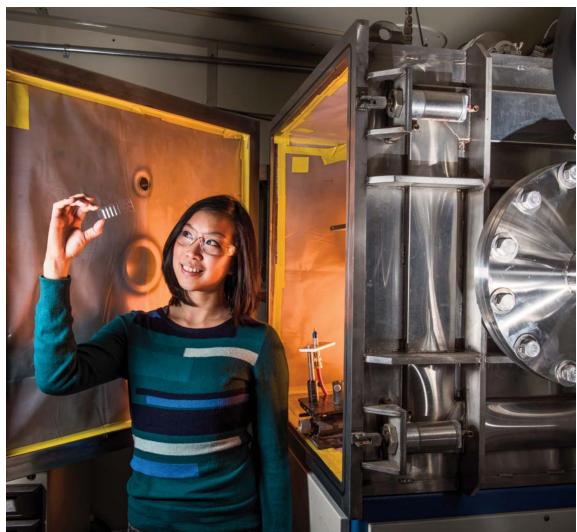
Coating at room temperature makes microelectronics design and fabrication more flexible and could someday lead to better, less expensive microelectronics components that underpin modern technology. The kinetic process produces nanocrystalline films that are very strong and could be used as protective coatings against wear, corrosion, oxidation, and the like.

Pylin says it's difficult to consolidate ceramic coat-

(Continued on page 5)

PYLIN SAROBOL (1832) looks at samples of carbide coatings as she stands in front of a Sandia deposition chamber. Pylin and colleagues are working on a process to lay down ceramic coatings kinetically, avoiding the high temperatures that otherwise would be required.

(Photo by Randy Montoya)









HELPING THE HOMELESS in California. Page 3.



MENTOR, STUDENT honored for research. Page 9.



TMS honors researcher Stephen Foiles. Page 8.



JULIAN VIGIL tapped as Churchill scholar. Page 9.



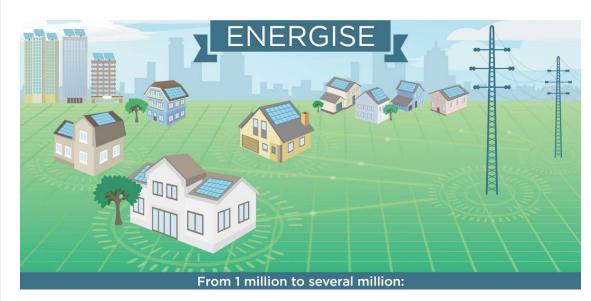
FEBRUARY 19-25, 2017

See page 2

## **Power players**



## Sandia receives ENERGISE award to study how to help utilities better manage power systems



#### By Stephanie Holinka

andia has been awarded \$2.5 million over three years to help utility companies better visualize, manage, and protect power systems as they include increasing numbers of distributed energy resources (DER) such as wind and solar.

The project creates open-source advanced distribution management system (ADMS) algorithms that help grid operators better assess the status and health of their power systems. The algorithms will be added to commer-

cial management software to allow utilities to optimize distributed energy resources so they can better manage voltage fluctuations and protect the system from faults.

"The project will create the world's first demonstration of an open-source, secure, resilient, optimization platform," says principal investigator Jay Johnson (6112). "The algorithms aggregate field data like inverter data, data from smart meters, and industrial control (SCADA) data from utilities to generate an accurate picture of

(Continued on page 4)

#### That's that

Have you seen the teasers in the Sandia Daily News for the upcoming Shoe Box Challenge? The contest, part of the Labs' observance of Engineers Week 2017, tasks self-selected teams, both technical and non-technical, to build some thing to be specified on Feb. 20 when shoe boxes are handed out. The teams can only use the parts in the shoe box and the thing to be built, whatever it is, must meet certain dimensional requirements.

According to the rules, the teams must complete the challenge on their own time before or after work. Organizers estimate the project should take a team of six (the maximum allowable number of members) a couple of hours a night over the course of two or three evenings.

The teams' entries will be judged on Feb. 23 in two categories, technical and creative, and winners will be announced immediately following the judging. As I write this, a full week before the registration deadline, more than 60 teams have already signed on, so clearly there is a lot of interest in this activity.

When I first saw the SDN item about the challenge I was a bit skeptical. It initially struck me that this was a rather frivolous activity for a national laboratory. Isn't this the kind of thing kids do as school projects? As I thought about it though, I began to see the brilliance of engaging our staff in this activity. It literally encourages out-of-the-box thinking — taking stuff out of a box and assembling it in novel ways. And besides, play may be one of the most serious things we do.

No less a thinker than Albert Einstein is famously quoted as saying, "Combinatory play seems to be the essential feature in productive thought." Note that Dr. Einstein doesn't say "an" essential feature; he says play is "the" essential feature. And physicist Richard Feynman, one of the great minds of the 20th century, said, "Play is hard to maintain as you get older. You get less playful. You shouldn't, of course."

On the subject, do you remember the ultimate Shoe Box Challenge, one for which the correct solution was literally a life-and-death matter? I'm talking about the incident depicted in Apollo~13 — and it happened in real life pretty much as it was shown in the movie — where the lunar module's circular  ${\rm CO_2}$  scrubber canisters were almost depleted and the square canisters used in the Command Module wouldn't fit in the LM canisters' round hole. Unless a solution was found, the three astronauts would die.

When the problem is explained to him, flight director Gene Kranz says, "Well, I suggest you gentlemen invent a way to put a square peg in a round hole. Rapidly."

The scene cuts to another office where technicians hurriedly dump onto a table the contents of several boxes containing the same equipment and tools that the astronauts have in spacecraft. The team lead says, "We've got to find a way to make this" — holding up a square  $\mathrm{CO}_2$  canister — "fit into the hole for this" — holding up the round canister — "using nothing but that" — waving his hand toward the stuff on the table.

The team came through and the astronauts were saved, thanks in no small part to the fact that their standard onboard gear included rolls of duct tape. Without the tape, the clever fix may have been impossible. It's incredibly versatile stuff.

I can attest from experience that there's a lot of truth in the observation by Clint Eastwood's character, Walt Kowalski, in the movie *Gran Torino*: "Take these three items right here. . . . WD-40, vise grips, and some duct tape. Any man worth his salt can do half the household chores with just those three things."

And maybe you've heard the old saying, "If it doesn't move, and it should, use WD-40. If it moves, and it shouldn't, use duct tape." That adage has actually inspired a commercial product called the Ultimate Redneck Repair Kit, a small spray can of WD-40 bundled with a small roll of duct tape. It's a key component of about half the great home-brewed engineering inventions you can find online.

Hmmmmm. I wonder if there'll be any duct tape in that Sandia Shoe Box Challenge? Nah, that'd make things too easy.

See you next time.

- Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)



FEBRUARY 19-25, 2017

#### **Engineer Week Agenda**

Monday, Feb. 20 — Teams pick up kits for Sandia's first Labs-wide Shoe Box Challenge. Go to e-week.sandia.gov for details on when and where to get the kits for Sandia's various sites.

Thursday, Feb. 23 — National Security Speaker Series talk, Robie Samanta Roy, vice president for Innovation and Technology for Lockheed Martin, speaking on "The National Security S&T Enterprise: Challenges and Opportunities," 10:30 a.m., Steve Schiff Auditorium. For additional information, see story below.

Thursday, Feb. 23 — Judging for the Shoe Box Challenge, with awards presentations at the end of judging in two categories: technical and creative. For information on judging sites, go to e-week.sandia.gov.

#### E-Week speaker

"The National Security S&T Enterprise: Challenges and Opportunities"

Robie Samanta Roy, vice president of Technology Strategy and Innovation at Lockheed Martin Corp., will give a talk during Sandia's Engineers

Week observation on Feb. 23 as part of the National Security Speaker Series.

Roy develops and provides technical intelligence and strategy for the corporation; engages the global science and technology ecosystem outside the corporation, including



ROBIE SAMANTA ROY

government labs, universities, and businesses; and fosters cross-enterprise innovation.

In his talk, "The National Security S&T Enterprise: Challenges and Opportunities," Roy will discuss the nation's preeminent defense and security capabilities as being the product of the visionary leadership and unique geopolitical environment of the post-World War II era. He will discuss the challenges facing the enterprise, ranging from aging infrastructure to talent retention to global competition to fiscal pressures, and the current opportunities for change.

The event will be held in the Steve Schiff Auditorium on Thursday, Feb. 23, 10:30-11:30 a.m. MST, and will be videolinked to Sandia/California (9:30-10:30 a.m. PST) and Sandia's Washington, D.C., office (12:30-1:30 p.m. EST).



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Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corp., for the US Department of Energy's National Nuclear Security Administration.

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Published on alternate Fridays by Internal & Digital Communications Dept. 3651, MS 1468

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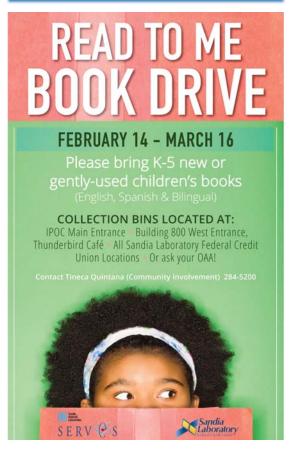
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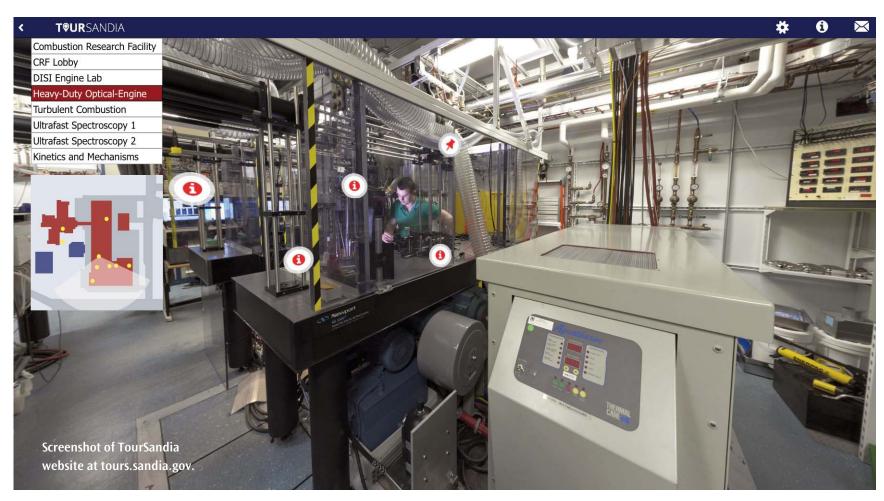
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The *Lab News* is available on online at www.sandia.gov/news/publications/labnews/.





## 'TourSandia' without a badge

#### By Madeline Burchard

ou no longer need a badge to visit Sandia, thanks to TourSandia, a collection of virtual tours that showcases the Labs' capabilities. Now anyone with an internet connection can visit eight locations from the Albuquerque and Livermore laboratories. No paperwork required.

Sandia/California facilities comprise three of the eight virtual tours available for public viewing. The additional tours take visitors to key places in Albuquerque such as the Z machine and the Microsystems and Engineering Sciences Applications (MESA) complex. Inside each tour module, you can explore laboratories in 360 degrees, watch videos, and read about the important work done at each location.

TourSandia is the product of a collaboration between Talent Management and Development (3520), Communications (3600), and corporate historians from Center 9500 to introduce new employees to the unique capabilities and facilities at Sandia.



"While the original impetus was to target new employees, it soon became clear that virtual tours could play a role in recruiting new employees to join the Labs," says Michael Cassady (3520), a member of the development team. "We wanted to lean into a focus on California facilities because of the need for persistent recruitment and engagement as well as the California site's track record as an early adopter of innovative programs."

TourSandia was designed to engage audiences of any background with Sandia's important mission, unique work, and dedicated people. Visit TourSandia at tours.sandia.gov and share with your friends, family, and future Sandians.





## Living the motto Sandian provides 'exceptional service' by volunteering for homeless count



ANDREW KOSYDAR (8114) hitting the streets of Sacramento for the biennial homeless point-in-time count.

#### **By Jules Bernstein**

ndrew Kosydar (8114) is demonstrating Sandia's motto of "exceptional service in the national interest" by volunteering for a national project to help end homelessness.

Andrew is one of about 350 volunteers who canvassed the streets of Sacramento County on Jan. 25 for the annual Point-in-Time (PIT) count.

"I believe those who are less fortunate deserve a helping hand, and this is one way I can extend that hand," Andrew says.

The Department of Housing and Urban Development (HUD) requires an annual county-by-county tally of people who live in transitional housing or emergency shelters. A count of those without shelter occurs every other year. HUD uses this data to fund homelessness prevention programs, supportive services, and housing programs nationwide. The data also is included in the Annual Homeless Assessment Report to Congress, which describes the overall scope of homelessness in America.

Results of the last PIT showed Sacramento City and County as having 2,659 people without safe, stable housing, including 948 who live without shelter of any kind. Results from every region nationwide are posted toward the end of the year on the HUD website.

As a resident of Sacramento, Andrew says he decided to participate in the city's unsheltered PIT count in 2015 and again this year because he feels a strong sense of responsibility to his community. "It's important to help take care of my fellow Americans," he says.

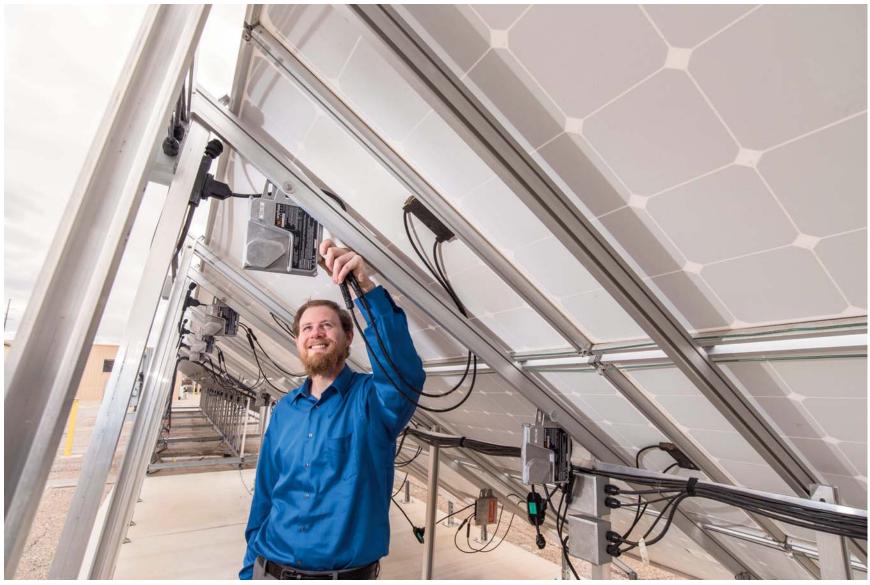
This year's count was heavily affected by recent storms. Andrew says that many of Sacramento's homeless typically occupy land near levies that surround the city, and also reside in northern areas near Discovery Park. Due to flooding and other factors, Andrew's group of volunteers encountered fewer people in 2017 than they did in 2015.

The ability to speak with people that he did meet outside was a positive experience for him. He says that canvassing is a great opportunity for personal interactions with individuals he otherwise might not meet. In addition to keeping a tally, volunteers survey the homeless for demographic information, veteran status, issues with physical or mental illness, and substance abuse. Care providers then are able to use this information to provide assistance that is targeted and more effective.

As a biologist and in his current role as a Sandia research scientist, Andrew knows data collection is key to solving complex problems. Andrew, who came to Sandia/California in October 2016, holds a PhD in biology from the University of Washington.

Canvassing for the PIT count is only one of Andrew's volunteer activities. During graduate school in 2008, Andrew held a Boren Fellowship, which allowed him to live and study in Syria. The fellowship, administered by the National Security Education Program, offers students an opportunity to learn languages spoken in regions critical to US interests. Andrew now serves as a mentor for other program fellows, helping them explore career opportunities.

Andrew plans to continue providing exceptional service both at the lab and after work, and says he will participate in the PIT count when it happens again in January 2019. Should readers be inspired to follow Andrew's lead, information for volunteering is available online.



SANDIA RESEARCHER Jay Johnson was awarded funds from the DOE SunShot Initiative to implement algorithms to help utility companies better manage their distributed energy resources.

(Photo by Randy Montoya)

#### **ENERGISE**

(Continued from page 1)

how the whole system is doing. With that information, the ADMS can adjust the behaviors of individual devices to make the whole system more efficient and safe."

The project is principally focused on making a lot of small devices, like microinverters on rooftop photovoltaic installations, work together to solve specific problems with high penetrations of renewables. To mitigate the voltage fluctuations from DERs, utilities currently can either add expensive voltage regulators to manage the swings, or they can have the DER devices themselves do that job, Jay explained.

By intelligently controlling DER functionality, Jay says, utilities can increase the deployment of variable generation without the need to purchase and install voltage regulators.

Sandia's "Voltage Regulation and Protection Assur-

ance using DER Advanced Grid Functions" project was selected for funding under the Enabling Extreme Real-Time Grid Integration of Solar Energy (ENERGISE) program through DOE's SunShot Initiative.

Data from DERs also increases operator situational awareness.

"Being able to see the whole system at a glance is increasingly important because, as a greater percentage of power on the grid comes from distributed resources, there can be greater swings in voltage," Jay says. "Most utilities do not have real-time, customer-level voltage information available to them right now."

Partners on the project include the Georgia Institute of Technology, BPL Global, the National Grid, and Public Service Company of New Mexico (PNM).

The software algorithms developed by Sandia in partnership with Georgia Tech will be put into a commercial software package and will first be validated and refined at Sandia's Distributed Energy Testing Laboratory (DETL). As part of the project, Sandia will collaborate with a

major national solar company to strengthen its cybersecurity posture by applying Sandia's Information Design Assurance Red Team (IDART) tools on an emulation of a system control network. The results of this work will be released as industry best practices and used as the starting place for a new DER cybersecurity working group being launched with this project.

In the third year of the project, the DER management software will be deployed at PNM and the National Grid utility installation in the Northeast.

When finished, the software will be released as an open-source product via an online repository for the source code created by SunSpec Alliance, a trade group for solar energy companies.

The DOE SunShot Initiative is a national effort to drive down the cost of solar electricity and support solar adoption. SunShot aims to make solar energy a low-cost electricity source for all Americans through research and development efforts in collaboration with public and private partners. Learn more at energy.gov/sunshot.

## Sunshot Initiative on target for 2020 goals

The DOE SunShot Initiative is a national effort to drive down the cost of solar electricity and support solar adoption. SunShot aims to make solar energy a low cost electricity source for all Americans through research and development efforts in collaboration with public and private partners.

The SunShot Initiative funds programs that reduce the cost of solar across residential, commercial, and utility-scale photovoltaics (PV) as well as concentrating solar power.

#### **SUNSHOT 2020 GOALS**

In 2011, the SunShot Initiative was launched and set a goal to lower the levelized cost of solar electricity in order achieve cost parity with conventional electricity sources by 2020. Those goals are:

- \$0.09 per kilowatt hour for residential solar
- \$0.07 per kilowatt hour for commercial solar
- $\bullet$  \$0.06 per kilowatt hour for utility-scale solar

The goals and the impacts on the industry were discussed in depth in the Sun-Shot Vision Study, which used models developed at the National Renewable Energy Laboratory to analyze and predict solar market growth.

As of November 2016 — five years into the program— the solar industry is already more than 90 percent of its way toward achieving SunShot's utility-scale goal and has also seen significant cost reductions in residential and commercial solar.

Learn more about progress to the 2020 goals to date and opportunities ahead in the On the Path to SunShot report series at goo.gl/vJTq1Z.

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#### **SUNSHOT 2030 GOALS**

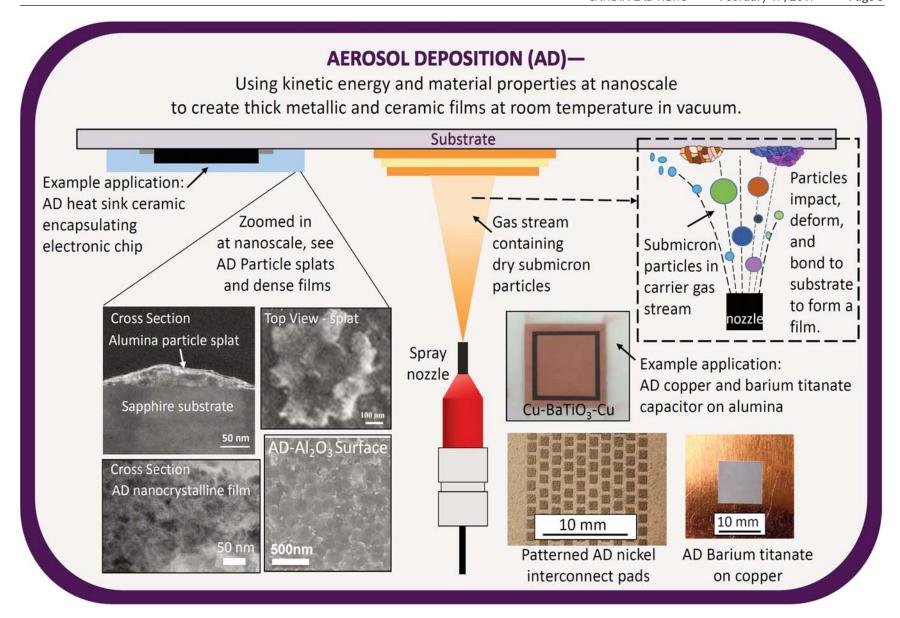
As the solar industry made rapid progress toward the 2020 targets, SunShot doubled down and committed to a further goal: to cut the cost of solar electricity an additional 50 percent between 2020 and 2030. These goals are:

- \$0.05 per kilowatt hour for residential PV
- \$0.04 per kilowatt hour for commercial PV
- \$0.03 per kilowatt hour for utility-scale PV

These goals are discussed in depth in the SunShot Initiative 2030 Goals Paper.

Beyond these cost targets, SunShot is working to advance grid-integration approaches in order to enable two-way power flow, increase demand response, and optimize electric vehicle charging. Such advances in combination with low-cost battery storage could enable economically competitive solar to be widely deployed across the country while also facilitating greater integration of other renewable power sources.

SunShot is also addressing market barriers that limit solar adoption, including streamlining processes to reduce project time cycles, expanding access to solar, and accurately representing solar's value in a more integrated energy system.



## Using kinetics, not temperature, to make ceramic coatings

(Continued from page 1)

ings and similar hard materials and then integrate them into devices with materials that have relatively low melting temperatures. Because ceramic components are processed at temperatures of about 1,300 degrees Fahrenheit (700 degrees Celsius) or more, it can be difficult to combine them with certain materials that have particular functions within electrical and mechanical devices. For example, current miniature waveguides require micro-machining out a tiny piece of electromagnetic material and gluing it onto another material.

"The ability to put down ceramics at room temperature means you can process ceramics and lower-melting temperature materials at the same time," says Pylin, who leads the project, now in its second year. "You can now put ceramics on copper, for example. Before, you had to make the ceramics first, then put the copper down on it. This process is really about being able to integrate materials, especially ceramics, with other materials."

It opens up new possibilities for fabrication — electrical circuits combining hybrid materials or tiny capacitors or sensors. "You can imagine spraying functional materials onto a circuit board rather than high-temperature processing, followed by tedious manual assembly," Pylin says.

#### Kinetic energy takes advantage of materials properties

Rather than heat, aerosol deposition uses kinetic energy and special material properties found at micro- and nano-scales.

There's still much to learn about the process.

"We really need to spend the time to understand the process parameters, how they relate to the resulting microstructures, and to the final material properties that we need," Pylin says. "When we think about designing a new device, we need to keep the relationship of structure-processing-properties in mind and allow ourselves time to perform the research, the optimization, and understand how we can make the properties of coatings better."

Room-temperature microscale coatings won't be a panacea, however, because the process produces nanocrystalline structures — not ideal for applications such as micro-actuators, micro-motors or capacitors that need large grain structure for better device function, she says.

"The aerosol-deposited coatings are made up of tiny, 20-nanometer crystals that we often call crystallites or grains," Pylin says. "When we heat our coatings, these tiny crystals grow and the properties change. By controlling the crystallite size, we can tune the properties in predictable ways to make more func-

tional devices" for different applications.

There are only a few places in the US that work on such room-temperature kinetic coating processes. Pylin's initial research came as principal investigator for a two-year Early Career Laboratory Directed Research and Development project, "Room Temperature Solid-State Deposition of Ceramics," that ended last March. It led to better understanding of the basic building blocks of coatings and the scientific fundamentals behind the process.

Next comes optimizing the process, expanding the materials that can be fabricated, and developing them for potential applications, which could take years.

In a nutshell, this is how it works: In aerosol deposition, a nozzle accelerates submicron particles suspended in a gas toward the surface. Particles impact and stick, building up a coating layer by layer. A key is

to use submicron particles, 50 times smaller than the diameter of a human hair, that allow researchers to tap into materials properties found only at small scales and activate plastic deformation in the aerosol particles. Plastic deformation, or plasticity, is a way to cause a substance to permanently change size or shape under applied stress. It's the plasticity of submicron particles that causes consolidation of

subsequent deposition layers and generates the continuous surface that layers are built upon.

Another key: deposition in a vacuum, which helps alleviate the effects of reflected gases on the flying particles. Reflection of the high-velocity carrier gas from the deposition substrate can create so-called bow shock, a gas boundary layer that's difficult for the smallest of particles to penetrate. But in a vacuum, reflected gases are diffused so the bow shock layer is thinner. The smaller particles traveling fast have high momentum and can get through the thin bow shock layer. Without a vacuum, the bow shock layer is large and particles don't have enough momentum to penetrate to the substrate.

#### Plastic deformation critical to process

Maintaining the particle kinetic energy through the bow shock layer is critical to achieve material plastic deformation, and without plastic deformation there's no sticking and no coating.

When a particle impacts the substrate or another layer, it plastically deforms and changes shape by a process known as dislocation nucleation and slip. Pylin's team discovered particles have nanofractures that make them "lay down onto a substrate like"

splatting cookie dough, forming a pancakeshaped grain."

The next particle that hits and deforms tamps down the original layer, creating an even tighter bond. "So you have both the materials deformation or shape change and fracturing without fragmentation, and finally the tamping from subsequent particles to help build the coating," Pylin says.

Those mechanisms make many layers possible, building up coatings that are tens of microns thick. "We have made nickel coatings as thick as 40 microns, and in literature I've seen reports of up to about 80 microns for ceramics," Pylin says.

Team members have successfully deposited multiple materials using the method, including copper, nickel, aluminum oxide, titanium dioxide, barium titanate, and carbide compounds. Likely applications

for this short list of materials alone include capacitors, resistors, inductors, electrical contacts, and wear

An enticing application specific to barium titanate films is electric field management in high-voltage systems. High-voltage capacitors, for example, are prone to failure where the dielectric material (barium titanate) meets the copper electrode and air, creating

a three-material junction.

"When we heat our coatings, these

tiny crystals grow and the properties

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lite size, we can tune the properties

— Sandia researcher Pylin Sarobol

"If you spray on barium titanate at this junction, you open up the possibility of higher power capacitors," Pylin says. "There's much more to do before we achieve good enough properties for that."

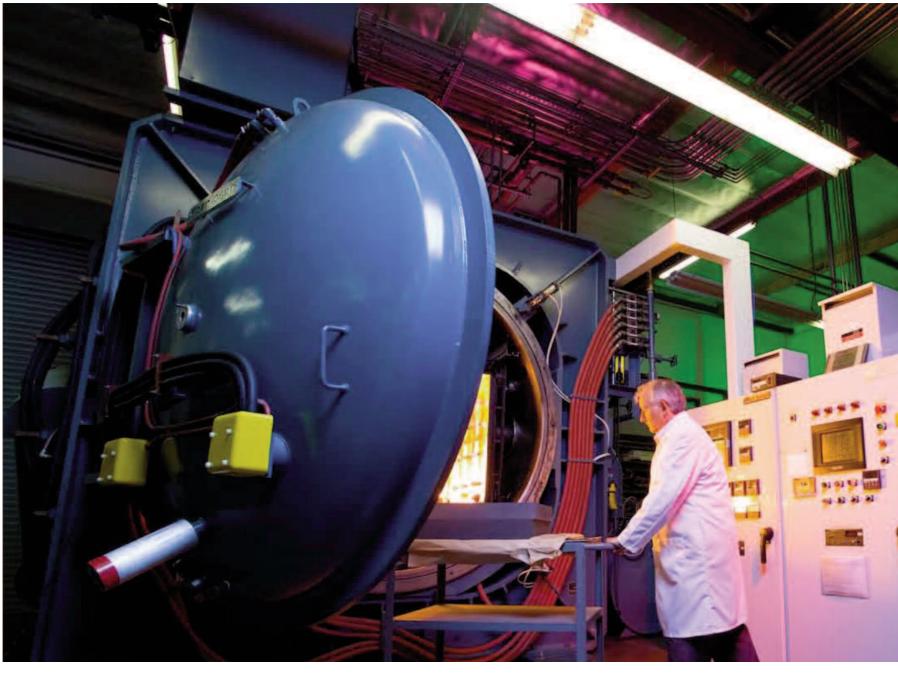
Other researchers are interested in electrical contacts, protective coatings, or consolidating brittle and intermetallic compounds for the first time.

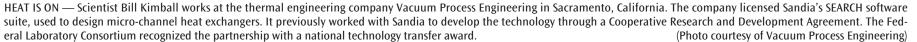
The process also spans the microscale gap between two established technologies, thin films and thermal spray technology. Thin films are coating layers, ranging in size from nanometers to a few microns, that can be defined into precision electrical circuits and are patterned via photolithography techniques instead of traditional printed circuit boards. Thermal spray technology can produce coatings starting at about 50 microns up to a few centimeters.

"This can bridge that missing gap, where you can start to deposit hundreds of nanometers of materials up to a hundred microns," Pylin says.

The team includes postdoctoral appointee Andrew Vackel, student intern Jesse Adamczyk, and technologist Tom Holmes, augmented by Materials Characterization and Performance Dept. 1819 and experts in 1814, 1816, 1851, 1111, and 1132.

SANDIA LAB NEWS • February 17, 2017 • Page 6 SANDIA LAB NEWS • February 17, 2017 • Page 7







POWER TO SPARE — The New Jersey Transit Rail Operations Center will benefit from the planned NJ TRANSITGRID, a first-of-its-kind electric microgrid for transportation that can supply highly reliable power during storms or other times when the centralized power grid is compromised. New Jersey Transit is working on the project with Sandia, which won a Federal Labora-

## Energy in the marketplace of the state of th

## Sandia takes home two national tech transfer awards

**By Nancy Salem** 

Sandia won the Federal Laboratory Consortium's (FLC) national 2017 Award for Excellence in Technology Transfer for a heat exchanger technology that makes power generation more efficient. And Sandia won the FLC's State and Local Economic Development Recognition award for its work on the New Jersey TRANSITGRID project.

The Technology Transfer award honors employees of FLC member laboratories and non-laboratory staff who accomplished outstanding work while transferring federally developed technology. The Economic Development award recognizes successful partnerships between state or local groups and federal laboratories that benefit the

Judging of the nominations is done by a panel of experts from industry, state and local government, academia, and the federal laboratory system.

"Sandia is honored to be recognized by our peers for our work in technology transfer," says Jackie Kerby Moore, manager of Technology and Economic Development Dept. 1933 and the Labs' representative to the FLC. "These awards are meaningful because they show Sandia at its best, working with groundbreaking technology to solve problems of a national scale and create economic competitiveness for US businesses."

#### **Heat-transfer efficiency**

The micro-channel heat exchanger (MCHE) is a technology that makes power generation, refrigeration, heating, and gas processing more efficient. In power generation, even small increases in heat transfer efficiency can greatly boost production and cut the cost of electricity.

Demand for industrial MCHEs has outstripped supply. Until recently, just one company — based outside the US

"Sandia implemented a fast-paced project plan while constantly adapting to changing market forces faced by VPE. . . . [this partnership with VPE has been] essential to making this happen, and the FLC award shows we are committed to creating real and immediate value for our partners."

— Matt Carlson, Sandia PI on SEARCH

— has done large-scale production of industrial MCHEs. A domestic supplier could reduce costs and increase supply and energy efficiency in a variety of uses.

Sandia's Selection, Evaluation, and Rating of Compact Heat Exchangers, or SEARCH, is a software suite used to design efficient MCHEs. The design requires a combination of analytical performance estimation, computational fluid dynamics, and finite element modeling, with each cycle taking from hours to days. Sandia's simplified design tool uses a sub-heat exchanger thermodynamic model, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code mechanical constraints, and a thermal-hydraulic solver within the Engineering Equation Solver platform to model any combination of liquid, gas, two-phase, and supercritical fluid.

The Labs partnered in 2014 with US manufacturer Vacuum Process Engineering (VPE) through a Cooperative Research and Development Agreement (CRADA) to commercialize the technology. Sandia licensed SEARCH to the Sacramento, California, company, which has used it to reach international quality standards, including ASME Boiler and Pressure Vessel Code certification, and enter the MCHE market as a domestic original equipment manufacturer. VPE produces MCHEs in the US and sells them domestically and internationally.

"Sandia implemented a fast-paced project plan while constantly adapting to changing market forces faced by VPE," says Matt Carlson, Sandia's principal investigator on SEARCH. "The project has expanded from a CRADA into a joint program between Sandia, VPE, and the Department of Energy to combine VPE's commercial goals and DOE's advanced power-production goals. The expansion has resulted in multiple improvements to the SEARCH software allowing VPE to respond quickly to customer

He says the teams at both Sandia and VPE "were essen-

tial to making this happen, and the FLC award shows we are committed to creating real and immediate value for our partners."

#### Reliable transportation power

Following a series of storms that shut down transit systems and damaged property that culminated in the Superstorm Sandy in 2012, New Jersey Transit Corp. (NJT) sought ways to reduce its vulnerability to power outages caused by natural or manmade disasters. In 2013, NJT signed a Memorandum of Understanding (MOU) to work for a solution with Sandia, DOE, and the New Jersey Board of Public Utilities. Sandia was brought in due to its microgrid research and development work for more than 20 US military bases.

NIT's rail service operates between the job centers of New York and New Jersey, and is the largest statewide public transit system in the country, covering a service area of 5,325 square miles and serving almost 900,000

Sandia's partnership with NJT focused on the Energy Surety Microgrid (ESM) developed at Sandia about 15 years ago. The Labs did a feasibility study under the MOU and, after an initial design was completed, New Jersey was awarded \$410 million from the Department of Transportation to develop NJ TRANSITGRID, a first-of-its-kind electric microgrid for transportation that can supply highly reliable power during storms or other times when the centralized power grid is compromised.

With DOT funding in place, Sandia began working with NJT on a CRADA valued at more than \$1 million to develop the TRANSITGRID. The proposed system would include a central, natural gas power plant and transmission lines to power substations that electrify tracks and operating controls on portions of the NJT and Amtrak systems. The facility would operate 24/7 and incorporate distributed energy, renewable energy, and other technologies to provide



"Sandia successfully applied microgrid design methods and tools that were developed as part of DOE and Department of Defense programs, primarily for military and high security infrastructure. In many ways, the project is even more challenging because it involves multiple states, jurisdictions, agencies, and complex legal issues."

Abe Ellis, manager, Photovoltaic and Distributed Systems

resilient power to key NJT stations, maintenance facilities, bus garages, and other buildings.

"This innovative partnership between Sandia and NJT will lead to the first critical civilian application of a design methodology developed for military installations and will help identify and address challenges to the widespread deployment of microgrids, including regulatory compliance," says Robert Broderick (6112), Sandia's current principal investigator on the project.

When completed, NJ TRANSITGRID will be one of the largest microgrids by capacity and geographical footprint in the US and a model to guide applications of resilient microgrids to other critical infrastructure.

"The NJ TRANSITGRID project is a large-scale microgrid specifically designed to improve resilience of critical infrastructure, rail transportation service in this case," says Abraham Ellis, manager of Photovoltaic and Distributed Systems Dept. 6112 and previous principal investigator on the project. "Sandia successfully applied microgrid design methods and tools that were developed as part of DOE and Department of Defense programs, primarily for military and high security infrastructure. In

many ways, the project is even more challenging because it involves multiple states, jurisdictions, agencies, and

complex legal issues. The FLC is a nationwide network of about 300 members that provides a forum to develop strategies and opportunities for linking laboratory mission technologies and expertise with the marketplace. The awards program annually recognizes federal laboratories and their industry partners for outstanding technology transfer efforts and has become one of the most prestigious honors in technology transfer. Since its establishment in 1984, the FLC has presented awards to more than 200 federal laboratories

"SEARCH and New Jersey Transit are great examples of how Sandia's scientific research translates into products that benefit the public, and at the same time enable our missions," says Mary Monson, senior manager of Industry Partnerships Dept. 1930. "These partnerships are important to Sandia's contributions in energy security, reliability, and efficiency. We look forward to engaging with additional partners to make these and other innovations more

**By Sue Major Holmes** 

TMS has honored Stephen Foiles of Sandia's Computational Materials and Data Science department with its 2017 Cyril Stanley Smith Award, presented for outstanding contributions to the science and technology of materials structure.

He will receive the award March 1 in San Diego during the 146th annual meeting of TMS, the Minerals, Metals & Materials Society.

"Cyril Smith was a very cool person, a sort of a Renaissance man, one of those names you recognize. To get an award named after someone of that stature is humbling," says Stephen (1814).

His manager, Amy Sun, says Stephen is well respected by his Sandia colleagues.

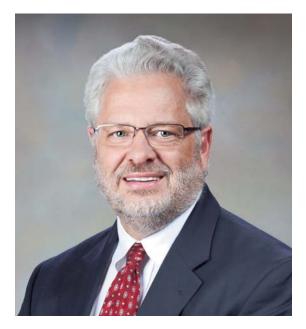
"His expertise in grain boundary dynamics has broad applications ranging from understanding fundamental mechanisms of part failures to quantifying the impact of strength in metals with impurity," she says. "Stephen always has a way of articulating complex, atomistic scale physics to concepts that engineers can relate to. I am not surprised that Stephen's work is equally influential external to Sandia, and he is the perfect candidate



The Minerals, Metals & Materials Society

for this well-deserved distinction."

Stephen has worked for Sandia since 1983. He spent the first 17 years of his career with Sandia/California before moving to Sandia/New Mexico. He is a co-recipient of the 2016 *Journal of Materials Science* Cahn Prize with Christopher O'Brien (6233) and is a Fellow of the



STEPHEN FOILES

Institute of Physics and the American Physical Society.
While working in California, he and two Sandia colleagues — Murray Daw, now at Clemson University, and Mike Baskes, now at Mississippi State University — developed what's now the standard formula for how

Mike Baskes, now at Mississippi State University — developed what's now the standard formula for how atoms interact in simulations of metals. His contributions to the development of the atomic-scale simulations include both molecular dynamics and Monte Carlo methods, most notably in the development of interatomic potentials that underlie those methods.

#### Work revolutionized the field of atomistic simulations

Corbett Battaile (1814), who along with Brad Boyce (1851) nominated Stephen, says Stephen and his collaborators developed the Embedded Atom Method in the mid-1980s for simulating the properties of metals at the atomic scale. "That approach revolutionized the field of atomistic simulations, and it's still used extensively today," Corbett says, adding that Stephen has used that and other methods to make major contributions to understanding the properties and behaviors of interfaces and defects in materials.

Stephen's years of work on the structure, thermodynamics, and mechanical properties of grain boundaries also have attracted interest. His recent studies of defects in metals and semiconductors focus on the variability of interfacial properties, including external conditions such as temperature and alloy composition. The research has

been funded by the DOE's Office of Basic Energy Sciences, Division of Materials Research; DOE's Advanced Simulation and Computing Program; and various Laboratory Directed Research and Development projects.

TMS, with headquarters in Pittsburgh, Pennsylvania, has nearly 13,000 members working in minerals, metals, and materials science from minerals processing and primary metals production to research and advanced applications.

## Award named in honor of metallurgy pioneer

Cyril Stanley Smith, for whom the prestigious TMS award is named, was a British metallurgist and

historian of science. He is most famous for his work on the Manhattan Project where he was responsible for the production of fissionable metals. A graduate of the University of Birmingham and Massachusetts Institute of Technology (MIT), Smith worked for many years as a research metallurgist at the American Brass Company. During World War II

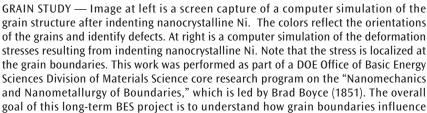


CYRIL STANLEY SMITH

he worked in the Chemical-Metallurgical Division of the Los Alamos Laboratory, where he purified, cast, and shaped uranium-235 and plutonium, a metal hitherto available only in microgram amounts, and whose properties were largely unknown. After the war he served on the Atomic Energy Commission's influential General Advisory Committee, and the President's Science Advisory Committee.

Smith founded the Institute for the Study of Metals at the University of Chicago, the first interdisciplinary academic organization devoted to the study of metals in the United States. He studied the details of faults and grain boundaries in metals, and developed theoretical models of them. In 1961, he moved to MIT as an Institute Professor with appointments in both the departments of Humanities and Metallurgy. He applied the techniques of metallurgy to the study of the production methods used to create artifacts such as samurai swords.— *Source: Wikipedia* 







deformation processes in nanocrystalline metals. The specific goal of these simulations was to investigate the experimental observation made both at Sandia and by other research groups of grain growth during indentation. The simulations were performed using the LAMMPS molecular dynamics code developed at Sandia by Steve Plimpton (1444) and colleagues in 1400 and which is extensively used worldwide. Stephen Foiles developed the underlying interatomic potential mode. The post-processing codes to analyze the data and generate the images were jointly developed by Stephen and his former post-doc, Garritt Tucker, who is now at Drexel University.

## Sandia mentor and student intern win joint ACS award

**By Neal Singer** 

he team of student intern Julian A. Vigil and mentor Tim Lambert (both 6124) has won a 2017
American Chemical Society (ACS) Division of Inorganic Chemistry Award for Undergraduate Research.
Julian will receive a financial stipend and a plaque;
Tim will receive a plaque for permanent display at Sandia.

Julian's research career began as a junior in high school, when he participated in an eight-week studentintern research program with Tim. During that Sandia program, called STAR (Science, Technology, And Research), Julian quickly learned to perform rotatingdisk electrode studies. His results were significant enough to make him a co-author with Tim and a university professor on Julian's first paper, submitted that summer and published Oct. 9, 2013. Since then, Julian has repaid Tim's continued interest in his progress not only by mentoring newer students but by contributing to and then leading the development of a number of promising nanoscale inorganic electrocatalysts for oxygen electrochemistry and/or water-splitting. In addition to serving as models to understand the process of catalysis in systems of interest, Julian's materials also have demonstrated excellent electrocatalytic activity and stability and hence are potentially a more cost-effective solution than the precious metals that are the current commercial standards.

Julian not only synthesized materials, evaluated their electro-catalytic performance, and performed background literature searches, he eventually — though still an undergraduate — wrote the main draft of five of his seven peer-reviewed publications in *Electroanalysis, Journal of Physical Chemistry C, Chemical Communication, ACS Applied Materials & Interfaces, RSC Advances, Journal of Materials Chemistry A,* and *Journal of Physical Chemistry C*, with Julian serving as first author on three of them. Two more manuscripts, all with Tim, are currently in preparation. The paper from his high school years has been cited at least 33 times; his undergraduate work has received 61 additional citations.

Meanwhile, Tim — in addition to mentoring Julian to become a productive independent researcher in the laboratory — has also educated him on professional aspects of science. These include how to present at national meetings, the importance of aiding in peer



STUDENT INTERN JULIAN VIGIL (left) published his first technical paper in 2013 with mentor Tim Lambert (6124), right, and a university of New Mexico professor while still in high school. Now, Julian and Tim have won a 2017 American Chemical Society (ACS) Division of Inorganic Chemistry Award for Undergraduate Research.

review, maintaining proper laboratory ES&H documentation, inventorying chemicals, and more.

Prior evidence of the strength of Julian's academic talents, combined with Tim's comprehensive educational research program, was demonstrated by Julian's recent designation as a 2016 Barry Goldwater Scholar.

"The tailoring of our program to fit Julian's part-time schedule is helping him to succeed and develop as a

scientist," Tim says.

The joint ACS award will be presented at the organization's national meeting in San Francisco, held April 2-6. As part of his award, Julian will give an invited talk during the Inorganic Division-sponsored "Frontiers in Undergraduate Research" symposium. Julian's talk is titled "Advances in Manganese- and Cobalt-based Nanostructures for Oxygen/Hydrogen Electrocatalysis."



JULIAN VIGIL

ulian Vigil, a Sandia student intern and University of New Mexico chemical engineering student, has just been awarded a Churchill Scholarship, named in honor of the famed World War II-era British prime minister. The program chooses 14 students to study at the University of Cambridge in England for a one-year master's degree program.

According to the Churchill Scholarship website, "The Foundation's

Scholarship Program offers American citizens of exceptional ability and outstanding achievement the opportunity to pursue graduate studies in engineering, mathematics, or the sciences at Cambridge."

Says Julian, "A lot of work in my studies and research made me competitive for the scholarship, but I also owe a lot of the credit to the many great mentors I've had in the faculty at UNM and the technical staff at Sandia Labs."



## Why is change so hard? Our brains aren't made for it

**By Elizabeth Roll** Sr. Administrator, Dept. 10654

Note: "Why is change so hard?" originally appeared 2/7/17 in the internal NW Blog (https://prod.sandia.gov/nwblog/). All Sandians with access to the internal Techweb can view the blog, which serves as a communications tool to deliver periodic information on a wide variety of Nuclear Weapons program-relevant topics, with a focus on the NW Program Management Unit, as well as executing line organizations. Email nwcomm@sandia.gov to offer topic suggestions, feedback, author ideas, etc.

Elizabeth Roll is an Executive Strategy professional with expertise in strategic planning, change management, and leadership coaching. She provides strategic planning for Center 5400 and the Integrated Military System Program and serves as a coach in Sandia's National Security Leadership Development Program.

- "I'm worried about what NTESS will do to benefits and pension."
- "Did you hear about what Honeywell did at another site they run?"
- "I don't know any of these executives; they all seem to be from Los Alamos. Do they even know who we are?"



ELIZABETH ROLL

I suspect that most of us are having, or hearing, sentiments of this nature. Why are we prone to anxiety and worry in the face of change? Unfortunately, our brains aren't made for it. Our brains crave certainty, and one way we find certainty is through pattern-matching. When our minds receive information, we go into our bank of past experiences and compare them to the current situation.

Often, we can find a match and figure out how to proceed. When there's a circumstance without any close corollary, especially like the one we're experiencing with the contract change, it's hard to find a good match to make us feel comfortable with what's happening and what might be the outcome.

When we experience the uncertainty of change, our limbic system, (the source of our fight or flight response), gets stimulated. Then, our brains start preparing for the worst.

While our brains hate uncertainty, they love choice. When a large change is underway, it's often difficult to figure out where our choices exist. However, there is one place choice always exists: in your perception of the change.

You have control over how you frame the change. Our cultural idioms of, "Find the silver lining," or "Make a silk purse out of a sow's ear," capture this idea.

David Rock, in his book, *Your Brain at Work*, outlines four approaches to reframe perception:

#### Approach

Reinterpret – Decide the change is no longer a threat

Normalize – Recognize that uncertainty is going to cause stress, and that's normal.

Reordering – Identify which of your primary values are being challenged by the change, and determine which secondary values may be more useful to you.

Repositioning – Seek other perspectives to inform and modify the way you're looking at the situation.

#### Sandia Application

How might the new contract be an opportunity to pursue the things you've always wished were different about Sandia?

Acknowledge that we don't know many details of the contract transition, and that limited information causes stress.

Consider using our Sandia value of learning as a shift in focus away from a value you believe is threatened. What might we learn from this transition and the new leadership team?

Consider, what might our new leadership be thinking about, and worried about, as they join

Reframing perception does not come naturally and is hard to do alone. I recommend seeking out a trusted colleague and talking through these questions. Managers may want to try out these questions with their teams. Teams may want to discuss both the upside and downside of the upcoming contract change. Finally, different people have different perspectives. Seek out someone outside your usual circle of interaction and see how they're framing the contract change.

Change is hard because our brains aren't made for it. But by reframing, we can offer the brain one thing it likes: choice in the face of uncertainty. This can help our limbic system calm down and make change not quite so hard.

1816 15

1521 15



#### SANDIA CLASSIFIED ADS

#### **MISCELLANEOUS**

DESK, white, laminate, TEMA, 64" x 30", w/matching filing cabinet, \$85. DuBay, 505-268-0307

MOVING SALE, great prices, like new items, https://goo.gl/R9dZTA. Castelluccio, 347-575-2539, moving.sale.abg17@gmail. com, ask for Gustavo.

LIGHT THERAPY LAMP, NatureBright Sun Touch Plus, MSRP \$55, asking \$30. Rodgers, 573-356-8914.

EXERCISE BIKE, CardioMax, stationary, upright, all steel, on-board computer, like new, cost \$529, asking \$50. Hollister, 717-2276.

SKI RACK, Yakima, 15-in. clamp length, all keys, round or aero clamps, good condition, \$50. Murata, 228-6901.

SKIS, Telemark, Karhu Outbound, 170 cm, 90-70-80 sidecut, cable bindings, \$80. Lorence, 237-1205.

FOLDING BIKE LOCK, hardened steel, link construction, pack-down size, 75 cm long, never used, 2 keys, w/Velcro carrier case, \$17. Wagner, 505-504-8783

SIMPLE ADDITIONS DISHES, Pampered Chef, white, 2 serving stands, ~17 pcs., can email photo, \$100. Garner, 505-269-3350.

Bldg. 802, elevator lobby

Bldg. 822, south entrance

Bldg. 880, Aisle D, north

Bldg. 894, east entrance,

Bldg. 831/832 north lobby

Bldg. 861, Cafeteria lobby

Bldg. 701, next to elevator

Bldg. 898, east lobby

Bldg. 810, east lobby

Bldg. 858 EL, lobby

Bldg. 892, lobby

Bldg. 887, lobby

Bldg. 891, lobby

Bldg. 836, lobby

Bldg. 870, lobby

Bldg. 823, lobby

IPOC, lobby

CGSC, lobby

CRSI, lobby

M.O. 308, lobby

lobby

lobby

FLAT SCREEN TV, 42-in., Samsung, 1080i HD, LED, \$200. Massey, 505-917-8124, ask for Karli.

SIDE STEPS, for '16 GMC Canyon-Chevy Colorado, black tube design, complete, new-in-box, \$150. Sansone, 296-7945.

SANDIA WOMEN'S GOLF AS-SOC. REGISTRATION, Feb. 23, 5:30 p.m., Manzano Mesa Multigenerational Center, 501 Elizabeth St. SE, http://swga.sandia.gov. Good, 505-259-9034.

BED FRAME, full/queen, heavy duty, 6 rollers, \$20; assorted microwaves, \$15; Sears portable kerosene heater, \$40. Walkington, 505-301-5175.

STOVE, Whirlpool, black glasstop, new, \$500; dining table, granite/glass, metal legs, 4 chairs, \$400. Armijo, 730-7819.

DESK, credenza w/desk, filing cabinet, good condition, view at https://albuquerque.craigslist.org/fuo/ 5990487645.html, \$550. Martinez, 505-228-6048.

CAMPER SHELL, '16 Tacoma SnugTop, DBL cab, short bed, white, like new, \$1,400 OBO, Shaw. 505-377-4914.

ARMOIRE & HUTCH, dark cherry finish, \$500/both. Hennessey, 505-506-7936.

Bldg. 960, lobby

Bldg. 905, lobby

Bldg. 962 (TA III), lobby

Bldg. 6585 (TA V), lobby

800(A), outside of Vicki's

**Lab News rack locations** 

FLUID TRAINER, CycleOps, lightly used, \$150. Raether, 505-363-1631.

ARMOIRE/ENTERTAINMENT CENTER, Basset, dark wood, beautiful, 4'W x 6'9" H, \$450 OBO; Kenmore refrigerator, w/water dispenser, \$200 OBO. Brito, 505-822-1201.

SUPPORT FABULOUS FELINES WILD LOVE, win romantic Valentines' dinner pkg., www.fabulousfelines.org. Stubblefield, 263-3468.

HANDBAGS, 2, Dooney and Bourke, never used, 1 forest green, 1 white, \$150 ea. Hussong, 505-280-4307.

TREADMILLS, ProForm XP 590s, ProForm Crosswalk. dual motion, both excellent, reasonably priced. Hanks. 249-1931.

WESTERN SADDLES, 2 mens (15-in. seat); 2 womens (14-in. seat), modern trees, tooled leather, good condition. Rivers, 720-4701.

DRYER, Kenmore Elite 2004, good condition, you pick up, free. Greathouse, 821-0980.

SKIS, XC/Touring, 2, size 200 & 210, Golden Team, w/bindings & poles, \$65. Jaeger, 505-299-0860.

ELECTRIC FOOD SLICER, Rival 1101E, chrome, boxed, like new, 6-3/4" stainless blade, (wafer thin 5/8"), \$50. Filusch, 505-899-0179.

DINING TABLE, Amish Connection, cherry, 42" x 60", 2 leaves, 6 chairs & 2-dr. low pie safe, \$3,000. Beach, 505-238-9869.

#### **TRANSPORTATION**

'96 DODGE 2500, 4x4, lifted, w/extras, needs some work, ~126K miles, \$3,275 OBO. Patton, 505-379-3287

'02 CHEVY S10 LS, extended cab, red, new tires, 17-in. custom wheels, 94K miles, \$4,200 OBO. Aragon, 505-881-4795.

'11 TOYOTA CAMRY LE, silver metal exterior, clean, very low mileage, 44K miles, excellent condition, \$10,500. Lin, 505-797-1567.

'04 TOYOTA SIENNA XLE, sunroof, leather seats, 124K miles, \$7,500. Kuper, 505-385-6048.

'89 BUICK REATTA, V6, AT, AC, functional touch screen, rear spoiler, red, 189K miles, reliable, \$1,900. Huppertz, 505-239-9718.

#### RECREATION

'10 COACHMAN CATALINA TRAVEL TRAILER, 26-ft., loaded w/options, just serviced, like new, \$9,500 OBO. Williams, 903-6397.

RECUMBENT BIKE, Body Flex Sports, model BRB2000, w/outdoor cover, \$100. Steiner, 505-379-9977.

'78 GL1000, black w/pin striping, Vetter fairing/hard bags, 1 owner, garaged, >100K miles, lovingly maintained, \$7,000 OBO. Jaramillo, 505-294-1779

'13 FOREST RIVER SUNSEEKER, Class C, LE series, M-22505, Chevrolet, 7,964 miles, like new, \$45,000. Evans, 505-292-2367 or 808-781-9787.

#### **REAL ESTATE**

2-BDR. HOME, 2 baths, lodgestyle, passive solar home, Sierra Vista South community, \$272,900. Jenkins-Knight, 239-5364

3-BDR. HOME, 2-1/2 baths, corner lot, mountain/city views, natural light throughout, Sandia Heights, MLS#883623, \$373,000. Newcomer, 505-850-9977.

4-BDR. HOME, 8805 Avenales Ave. NE, Sandia High, see Zillow video tour. Stafford, 505-332-3419.

3-BDR. HOME, 2 baths, 2,467sq. ft., High Desert neighborhood, city/mountain views, 15 mins. from base, \$389,000. Fernandez, 505-459-1648.

3-BDR. HOME, w/office, 1-3/4 baths, 1,770-sq. ft., new water heater & Master Cool unit, well maintained, SE Heights neighborhood, mins. to Louisiana gate, MLS#873495, \$145,000. Chavez, 505-450-2739 or 269-9265.

3-BDR. HOME, 2 baths, 1,574sq. ft., LR, DR, den, 1-car garage, large yard, 2 patios, close to base, 316 Espejo NE, MLS#883770, \$159,900. Morrison, 505-850-0401.

3-BDR. HOME, 2 baths, 1,463sq. ft., built 2014, Volterra subdivision, several upgrades, w/hot tub, \$225K. Cover, 505-228-5337.

3-BDR. HOME, 2 baths, 1,445sq. ft., 2-car garage, refrigerated air, hardwood floors, MLS#882338, \$143,000. Leilani, 505-934-7573 or Smith, 209-815-2176.

#### How to submit classified

DEADLINE: Friday noon before week of publication unless changed by holiday.

Submit by one of these methods: • EMAIL: Michelle Fleming (classads@sandia.gov)

• FAX: 844-0645

• MAIL: MS 1468 (Dept. 3651) . INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage Submit a Classified Ad." If you have questions, call Michelle

#### at 844-4902. Ad rules

- 1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
- Include organization and full name with the ad submission.
- Submit ad in writing.
- No phone-ins. Type or print ad legibly; use accepted abbreviations.
- 5. One ad per issue
- We will not run the same ad more than twice.
- No "for rent" ads except for employees on temporary assignment.
- No commercial ads.
- For active Sandia members of the workforce, retired Sandians, and DOE employees.
- Housing listed for sale is available without regard to race, creed, color, or national origin.
- Work Wanted ads limited to student-aged children of employees.
- We reserve the right not to publish any ad that may be considered offensive or in bad

4-BDR. HOME, 2-3/4 baths, 2 living areas, 2,700-sq. ft., lots of storage, Sandia High school district, \$185,000. Mozley, 884-3453.

#### **WANTED**

SQUAT RACK, bench & weights, will pick up, reasonable offers only. Omahony, 505-382-4179. RELIABLE CAR, gently used,

5+ yrs. old, low miles, 4-dr. sedan. Rhea, 505-227-4799.



### Mileposts



New Mexico photos by Michelle Fleming California photos by Randy Wong



**Daniel Sanchez** 



10262



**Andrew Steele** 15



9342



Xavier Zubiate 15



4128

#### Recent Retirees

New Mexico photos by Michelle Fleming California photos by Randy Wong



Bernard Argo



4879

24



Debbie Garcia Chavez 1234



Mike Overstreet 18



2547



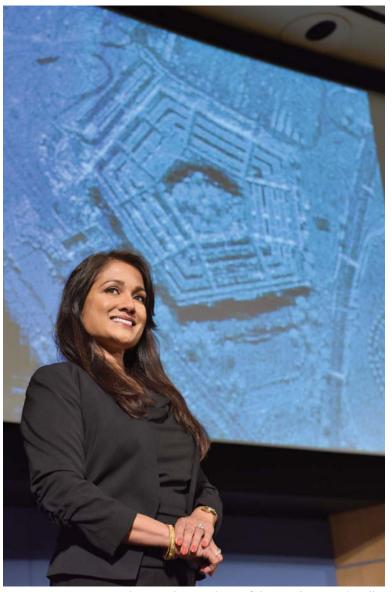
Michael Taylor 15

**Vonnie Taylor** 12

2617

## Born into engineering

#### Asian American engineer sees prestigious award as 'career achievement'



IREENA ERTEZA, a 2017 Asian American Engineer of the Year honoree, is a distinguished member of the technical staff. "In synthetic aperture radar, her work has significantly changed the way the community approaches SAR signal processing," says her manager. (Photo by Randy Montoya)

**By Lindsey Kibler** 

reena Erteza (5962) has engineering in her blood. She's had a love for it as far back as she can

"My father showed me what it is to be a scholar and an engineer," she says. "He was playful and creative. He gave me free rein to play in his workshop and to do projects alone or with him. We spent many hours working on cars, plumbing, lawn mowers, mopeds, computers, modems ... everything. He made me want to explore and excel in many diverse areas."

#### About AAEOY

AAEOY stands for Asian American Engineer of the Year, an annual national awards program that recognizes the most distinguished professionals for their leadership, technical achievements, and remarkable public service. As a part of the National Engineers Week (DiscoverE) program, AAEOY was

introduced in 2002.

This event has since become a prestigious and important forum for corporate America, academia, and government organizations to promote

STEM (science, technology, engineering, and mathematics) activities.

Past AAEOY honorees have included Nobel laureates, academic researchers, key corporate executives, and astronauts.

Besides recognizing outstanding Asian American engineers and scientists from across the country, special Distinguished awards celebrate the achievements of Asian Americans for their global stature and influence. Those awardees have served as role models and a source of inspiration for the STEM community as a whole. Many internationally known individuals have received these Distinguished awards at AAEOY events since 2002.

Ireena, an electrical engineer, has been named a 2017 Asian American Engineer of the Year (AAEOY). She will be honored in a ceremony Feb. 24 in Bellevue, Washington. She is the third woman from Sandia to receive the prestigious award since the program began in 2002.

The AAEOY awards program, celebrated each year during National Engineers Week, is sponsored by the Chinese Institute of Engineers-USA to salute Asian American professionals in science, technology, engineering, and math who demonstrate exceptional leadership, technical achievements, and public service. Fifteen Sandia engineers have earned an AAEOY title, and other past winners include astronauts, corporate executives, and Nobel laureates. Nominees come from a range of industrial, academic, government, and scientific institutions.

"I am very honored and humbled to receive this prestigious award as I start my 25th year at Sandia. It serves as recognition for the significance of my work — a career achievement award, in a sense," says Ireena. "Sandia has been a wonderful place for me to work and grow, providing me with incredibly interesting problems that also have a tremendous impact to the nation."

#### An all-around engineer

Ireena joined the Labs in 1993, after finishing her doctorate in electrical engineering at Stanford University. Early in her career, she

worked in the areas of integrated and diffractive optics and information systems. She subsequently developed expertise in radiation effects on optical processing systems, unattended ground sensor signal processing, synthetic aperture radar (SAR) signal processing and algorithm development, and high performance computing. Her biggest impact has been to national SAR systems.

"Ireena is known throughout the lab and in the national SAR community for her strong technical contributions and her strong leadership. While having deep technical knowledge in her areas of expertise, Ireena also has an amazing ability to see the big picture, allowing her to guide the community forward strategically. In

SAR, her work has significantly changed the way the community approaches SAR signal processing," says her manager Larry Stotts (5962).

Her career has been marked by innovative research efforts in computation and algorithm development, initiatives to standardize radar data formats, and work to make interaction with computational power easy and accessible to users. "Her contributions have been game-changing, allowing the value and power of SAR to be applied on tactically relevant mission timelines. Her work has brought success to Sandia and its customers," Larry adds, "and she continues to introduce fundamentally new concepts."

#### Born into engineering

In the late 1940s, Ireena's father came to the United States

to attend graduate school. He and his wife emigrated from East Pakistan — known today as Bangladesh and eventually settled in New Mexico, where he was a key faculty member in the electrical engineering department at the University of New Mexico (UNM).

Ireena's father never let gender affect her access to engineering; he had no doubts his daughter could become an accomplished scientist or engineer. She earned a Bachelor of Science from UNM and a Master

of Science and PhD from Stanford, all in electrical engineering

While studying at Stanford, Ireena met two role models who have mentored her long after graduation. One was her PhD adviser, professor Joseph Goodman. "He is an exemplar of a great scholar and great leader. He has always been an amazing advocate for me and

"Sandia has been a wonderful place for me to work and grow, providing me with incredibly interesting problems that also have a tremendous impact to the nation."

- Ireena Erteza

for all of his students." The other was fellow doctoral student, Brian Bray; he and Ireena have been married for 26 years. They are both distinguished members of the technical staff. The couple have one daughter, who is majoring in electrical engineering at Stanford.

"Sheryl Sandberg, chief operating officer of Facebook, has often said that the most important career choice you'll make is who you marry," Ireena says. "Brian has always encouraged and enabled me to pursue my dreams, and he has constantly inspired me to keep growing."

#### Mentee to mentor

For the past 30 years, Ireena has worked to be a strong role model for women pursuing science and engineering careers. She also has mentored in the community for more than 25 years, including early career employees at the Labs. She is a member of Sandia's recruiting and student intern programs. "As current professionals, we must make both work and non-work environments comfortable and welcoming," says Ireena.

In addition to STEM-focused mentoring, she has a passion for running and, 18 years ago, started a trail running group. Every Sunday the group meets to run trails in the Sandia Mountains, the foothills, or around the city. "The mission of the group is to provide an encouraging environment for novice runners and a comfortable environment for more experienced runners to enjoy the amazing natural trails in Albuquerque."

Ireena has participated and placed in dozens of local



ASIAN AMERICAN ENGINEER OF THE YEAR recipient Ireena Erteza, left, with husband Brian Bray and daughter Iliana Bray. Brian, Ireena says, "has constantly inspired me to keep growing." (Photo courtesy of Ireena Erteza)

and national races, and she has been a nationally ranked novice racquetball player. A healthy work-life balance has contributed to her successes, and she strives to share that with those she mentors.

"Engineering is such a wonderful and fulfilling field, and I hope I can be a role model not only for young women but for all young people. It's important for them to understand that success as an engineer doesn't depend on gender or ethnicity," she says.